

Increase of Storage Shelf Life of Locally Produced Salted/Dried Fish by Redrying and/or Packaging

By

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Introduction

Generally salted/dried fish are produced locally during the fishing season using surplus fish and marketed in the following lean season as a substitute for fresh fish. Therefore salted dried fish are sometimes stored for periods of over 2 months before being marketed, and deterioration in quality of this processed product would occur then. Hence experiments were conducted for prolonging storage life by redrying and/or packaging.

Materials and Methods

Fish Samples

Dried salted samples of marine fish were purchased at Talaimannar. Leatherskin (*Chorinemus lysan*) had been dry salted and the Gizzard shad (*Goniolosa manminna*) wet salted. The samples were about 4 days old when purchased. They were tied up in DAC paper sacks (3-ply paper sack with an inner polyethylene lining) and transported to Colombo.

Redrying

A portion of the two species of the salted dried fish were redried in a mechanical dryer at 50° C for 12 hrs.

Packing

Portions of the redried and non-redried Gizzard shad were sealed in polyethylene bags.

Storage

Unpacketed, redried and non-redried samples of Gizzard shad and Leatherskin were kept uncovered in plastic boxes in a room at 24° C.-32° C and 72% -86% relative humidity for the storage period.

Sensory inspection of quality

The texture and moisture content were assessed by touch and the extent of bacterial "pinking and mould attack were recorded. The degree of insect infestation was assessed visually. The odour of the samples was also noted.

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Salt content

Salt content was determined as chloride where the ions are precipitated with silver nitrate and the excess silver ions are determined by titration with potassium thiocyanate (Pierson, 1970). All analyses were performed in duplicate.

Moisture Content

Duplicate samples (2g.) were dried in a convection oven at 105° C/24 h. The weight loss was taken as due to evaporation of water.

Bacteriological Analysis

Dried fish (10g.) were chopped aseptically into small pieces and weighed into sterile blender jars (MSE homogeniser). After the addition of 90 ml. sterile saline water (9g. sodium chloride and 1g. peptone per 1 litre), the contents were homogenised for 2 minutes. Sampling was carried out in either triplicate or duplicate for each species.

Total Counts

Total counts were made according to standard procedure of serial decimal dilution where diluted aliquots (1ml.) were mixed with molten Plate Count Agar (Difco). The plates were incubated at 30° C/72 h.

Results

The storage life of salted/dried Leatherskin and Gizzard shad is 51 days (Fig. 1, Tables 1-7) under storage temperatures of 24° to 32° C and relative humidity of 72% to 86%. The storage life was further prolonged by 7 days (58 days) on redrying.

Packeting of Gizzard shad in polyethylene bags prolonged the storage life by 36 days, and the redried, packeted Gizzard shad was found to be in excellent condition even after 87 days of storage.

DISCUSSION

Redrying of Leatherskin and Gizzard shad prolongs the storage life of fish by 7 days. Packeting of Gizzard shad in polyethylene prolongs storage life by 36 days. Also redrying and packeting of Gizzard shad prolongs storage life easily for longer periods than 3 to 4 months.

This shows that redrying is not practically useful in improving the storage shelf life of salted dried fish unless this fish is also packeted for the results indicate that packeting treatment is more effective than redrying. But packeting in polyethylene bags poses some problems, for example damage of packet lining by fish bone and spine, high cost of such material, and the very rare and remote chance of infection by anaerobic pathogenic bacterium such as botulinum.

However, the DAC sack (a three-ply paper sack with an inner polyethylene lining and capable of holding 25 to 30 kg. of dry fish) is suitable for packeting small salted/dried fish. These bags are made in Norway and the CIF price is Rs. 6.00 per bag ; and this means that the additional packing cost from use of a DAC sack is only 10 cents per pound of dry fish.

Microbial growth on salted/dried products is dependent on water activity, a measure of the free or available water in food. This water is not linked to other components of food and is free to react chemically or, in spoilage, to support the growth of micro-organisms. Hence in marine species such as Gizzard shad and Leatherskin with salt contents of 33.3% and 39.9% (dry base)

the maximum moisture contents that would inhibit halophilic bacterial growth, i.e., 38.7% and 43.1% respectively. This means that in order to inhibit halophilic bacterial growth it is necessary to keep the moisture content below these levels throughout the storage period.

Conclusion

The storage shelf life of locally produced salted dried fish under normal conditions (24° C.—32° C. temperature and 72%–86% relative humidity) is 51 days. The storage shelf life of fish redried at 50° C for 12 hrs. is extended by a mere 7 days which is not worthwhile for the trade. But redrying and packeting of Gizzard shad in polyethylene maintains the fish in excellent condition for well over 87 days. The use of air-tight bags such as DAC sacks by local fishermen for storing good quality salted dried fish is recommended.

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TABLE 1

SALT CONTENT AND MOISTURE CONTENT

Species	Salt Content (dry. base %)	Moisture Content (%)
Gizzard shad ..	33.3	48.9
Leatherskin ..	39.9	43.2

TABLE 2
ANALYTICAL RESULTS OF NON-REDRIED/UN-PACKETED G. SHAD

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and Observation</i>
9	—	48.9	—
19	—	43.2	—
26	—	44.3	—
34	4.1×10^3	40.4	Tissue moist and soft. No insect and fungal attack.
40	—	45.2	White fungal attack and slight pink bacteria on some fish.
51	1.6×10^6	44.3	Tissue soft and moist. 50% pink bacteria and 30% white fungal attack.

Fish discarded.

TABLE 3
ANALYTICAL RESULTS OF NON-REDRIED/PACKETED G. SHAD

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and Observations</i>
9	—	48.9	—
19	—	—	—
26	—	45.8	—
34	—	—	—
40	—	44.8	Slight white fungal attack.
51	5.7×10^7	44.9	Tissue fairly hard and slightly moist. Off odour 20% white fungal attack.
58	—	—	—
64	1.5×10^6	43.6	Tissue soft but no moisture on surface. 80% white fungal attack.
87	3.0×10^8	43.9	Tissue soft in some ; others fairly hard. 30% pink bacterial attack in some fish. 30% white fungal attack in all fish. No insect attack, slight NH_3 smell.

Fish discarded.

TABLE 4
ANALYTICAL RESULTS OF RE-DRIED/UN-PACKETED G. SHAD

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and Observations</i>
9	—	39.9	—
19	—	32.0	—
26	—	39.0	—
34	1.7×10^4	35.8	Tissue soft. No insect and fungal attack.
40	—	43.6	—
51	1.0×10^5	37.6	Tissue hard but 20% of tissue moist. Slight white fungal attack
58	2.7×10^6	45.3	Tissue moist. 50% pink bacterial attack and 75% white fungal attack.

Fish discarded.

TABLE 5
ANALYTICAL RESULTS OF RE-DRIED/PACKETED G. SHAD

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and observations</i>
9	—	39.9	—
51	2.1×10^4	21.6	Tissue hard, not moist, no fungal attack, good condition.
64	1.9×10^4	29.7	Tissue hard, no fungal or bacterial attack. Still good condition.
87	7.0×10^3	31.9	Tissue hard in excellent condition but storage experiment discontinued.

TABLE 6
ANALYTICAL RESULTS OF NON-REDRIED LEATHERSKIN

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and Observations</i>
9	—	43.2	—
19	—	47.7	—
26	—	51.2	—
34	7.9×10^3	52.0	Tissue very soft and moist. No fungal, bacterial, or insect attack.
40	—	54.3	Slight white fungal attack, mainly near head region.
51	2.0×10^5	54.4	Tissue soft and mealy, off-odour, 100% white fungal attack.
58	—	—	—

Fish discarded.

TABLE 7
ANALYTICAL RESULTS OF REDRIED LEATHERSKIN

<i>Storage period (days)</i>	<i>Total plate count (No./gr.)</i>	<i>Moisture content (%)</i>	<i>Appearance and Observations</i>
9	—	28.2	—
19	—	27.6	—
26	—	43.4	—
34	2.3×10^3	45.7	Tissue fairly hard. No fungal, bacterial or insect attack.
40	—	45.4	Slight white fungal attack mainly near head region.
51	8.1×10^5	49.9	Tissue moist and soft but not mealy. 50% white fungal attack.
58	1.4×10^5	46.0	Tissue moist but fairly hard in some regions. 100% white fungal attack. 30% beetle attack.

Fish discarded.